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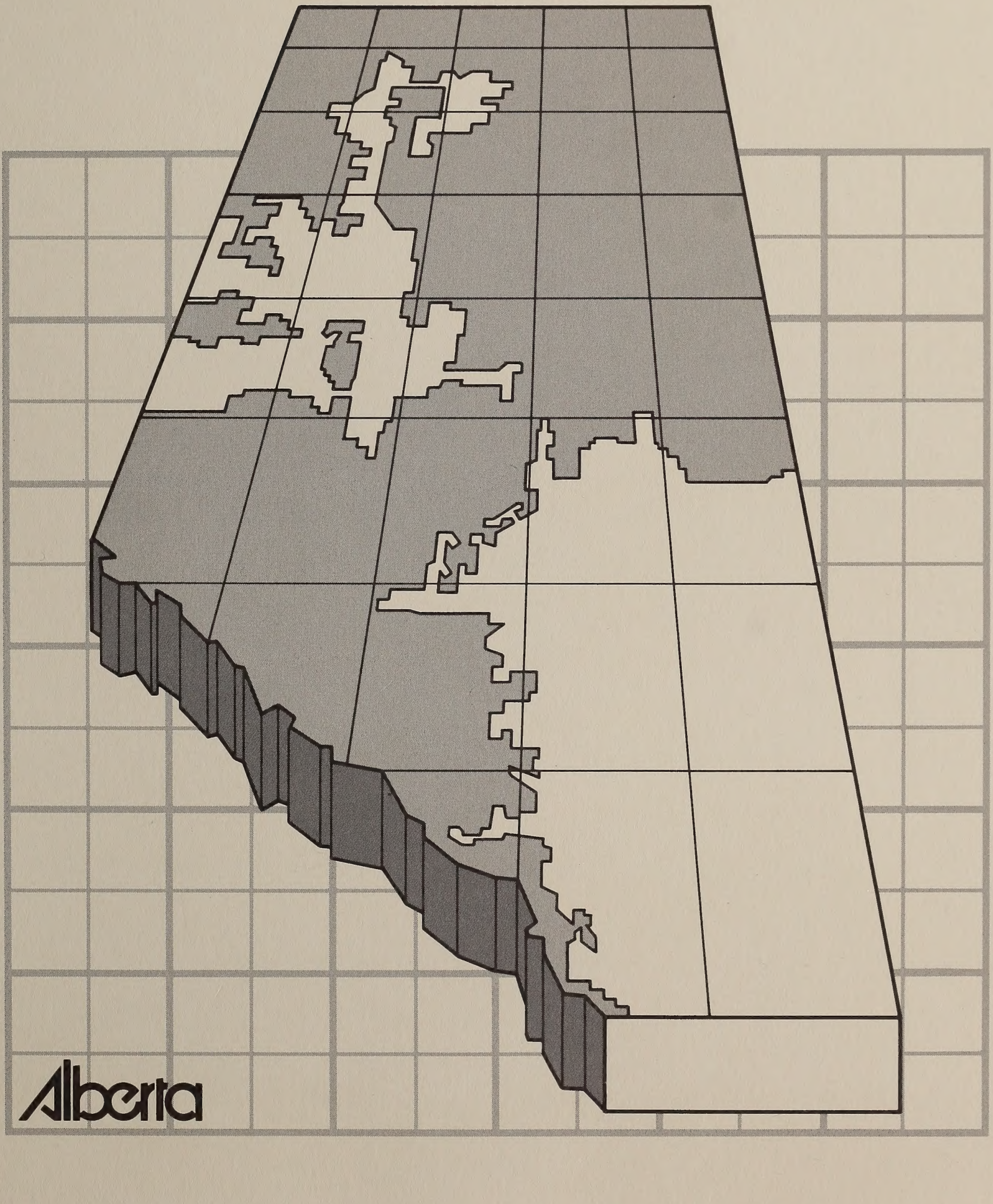
Agricultural Land Base Study

Executive Summary



Alberta

DDN 7920628

Agricultural Land Base Study: Development Opportunities for the Future

Preface

The purpose of the Agricultural Land Base Study was to examine and compare a number of long-range resource management opportunities for expanding and intensifying agricultural production in Alberta. While current economic conditions do not favour investment in resource development, this study looks further down the road and examines production and economic opportunities in the next 50 to 100 years. The results provide a provincial, regional and on-farm perspective to the 10 identified development options and can therefore serve as a framework for future decision making by both government and private resource managers.

A number of steps would be required before the development options described in this study could be implemented. The prime locations for each option would need to be identified and the financial and economic results would need to be refined from a regional perspective. Another requirement would be to examine the feasibility of partial development under each option. Resource conservation opportunities would also need to be identified in order to achieve sustained benefits to all Albertans from our land and water resources.

Alberta
AGRICULTURE
ENVIRONMENT
FORESTRY, LANDS AND WILDLIFE
MUNICIPAL AFFAIRS
TRANSPORTATION

JANUARY, 1988

880314

Executive Summary

A. Terms of Reference

Five departments of the Government of Alberta participated in the Agricultural Land Base Study: Agriculture; Forestry, Lands and Wildlife; Environment; Municipal Affairs; and Transportation. While most of the research was conducted by provincial staff using existing information, the analysis of drainage potential was undertaken primarily by consultants.

The five objectives of the Agricultural Land Base Study were:

1) to identify the natural resource management options available for the expansion and intensification of Alberta's agricultural land base;

2) to identify the geographic distribution and the maximum potential increase in agricultural production achievable through the application of the management options;

3) to assess the relative economics of the management options;

4) to evaluate the impact of such management options on other resource uses; and

5) to identify existing government programs that promote the application of the management options.

B. Assumptions

Because of the provincial scope and long-range nature of this study, a number of assumptions were required. An understanding of these is important for interpreting the study findings.

1) The development potential for a number of options was based on Canada Land Inventory Soil Capability for Agriculture (CLI) classification, using 1:1 million scale maps.

2) All options were undertaken to their full potential. Conservation needs were identified, as were unavoidable impacts on other resources.

3) All agricultural output was assumed to have a market, although market opportunities and economic conditions were not analysed in this study. Prices and yields were based on averages for the 10 year period of 1973 to 1982. Production costs and subsidies were based on 1982 levels.

4) All additional on-farm investment was based on borrowed capital. All economic and financial results are given in terms of returns to land, labor, management and existing investment. These inputs were not treated as costs. The residual value of equipment and land (the increased land value resulting from development) at the end of the period of analysis was included as a benefit.

5) A real discount rate of five per cent was used in this study. A real discount rate is the difference between the interest rate charged to borrowers and the rate of inflation.

6) The period of development was 100 years for the Green Area Conversion, Irrigation Expansion and Drainage options. All other options were developed over a 50-year period.

C. Findings

The following ten resource development options were examined in the Agricultural Land Base Study:

1. Green Area Conversion
2. Irrigation Expansion
3. Drainage
4. Deep Plowing
5. Liming
6. Summerfallow Reduction
7. Range Improvement
8. Prairie Range Conversion
9. Woodland Conversion
10. Saline Soil Reclamation

These options represent the major physical or resource management opportunities for increasing agricultural production in Alberta. Acreages suitable for development were estimated and maps were produced to illustrate the geographic distribution of each opportunity. Economic analyses were done to quantify the costs and benefits which would result from each development opportunity. The Impact Analysis quantified the measureable impacts of agricultural development on competing resource uses and described expected effects where quantifiable information was not available. The Direct Net Benefit analysis was based on agricultural benefits less investment costs and lost benefits in forestry, hunting and trapping. The analysis of Growth in the Provincial Economy indicated direct and secondary value added from increased agricultural output and investment, less the corresponding losses in forestry, hunting and trapping. Losses of values such as native subsistence and non-consumptive use of wildlife could not be quantified. All dollar amounts are present value equivalents of a stream of benefits or costs in future years. Details on the calculation of these costs and benefits can be found in the Summary Report for this study.

The first three opportunities shown below would require major infrastructure development.

1. **Green Area Conversion**. A large acreage of arable land in the forested, non-settled Green Area could be cleared for cultivated crop production. Financial returns to farmers with little or no equity would be negative due to high land clearing and other investment costs. At the farm level, with no farmer equity, an average loss of $18 per acre per year over the first 30 years can be expected. Conversion of 9.2 million acres would have a major impact on timber production and wildlife, and would require a large investment in community and road infrastructure. However, the oil and gas and tourism sectors could benefit from road and other infrastructure development. Conservation measures would be required to avoid significant negative impacts on soil and water resources.

   Direct Net Benefits: Conversion would produce benefits in the agriculture sector of $1.7 billion. Deducting total investment costs of $1.5 billion and lost forestry, hunting, trapping and grazing benefits of $1.1 billion would produce a loss of close to $820 million.

   Growth in the Provincial Economy: Full implementation of this option would result in a reduction of $1.9 billion.

2. **Irrigation Expansion**. With existing water supplies in the region, irrigation development could almost double in South-eastern Alberta, where lack of sufficient precipitation limits agricultural production. Irrigation Expansion would be feasible at the farm level, producing an increased average annual farm cash flow of between $26 and $129 per acre, over and above dryland returns, depending on location. Irrigation of an additional 1.1 million acres would create significant benefits, such as municipal and industrial water supply, soil conservation and regional agricultural stabilization, but would require a large investment in infrastructure. Water quality and fish habitat conditions would decline in some areas but would improve in others as a result of irrigation expansion. Other water based recreation opportunities would also increase. Modern irrigation, water delivery and conservation methods would be required to prevent the spread of soil salinity and erosion.

   Direct Net Benefits: Full Irrigation Expansion would produce benefits in the agriculture sector of $640 million. Deducting total investment costs of $1.8 billion and lost hunting benefits of $6 million would produce a loss of $1.2 billion.

   Growth in the Provincial Economy: The direct and secondary effects of increased agricultural output and investment activity would be $1.9 billion.

3. **Drainage**. The drainage of non-permanent wetlands in the White Area (settled portion of the province) would bring new land into production and reduce the cost and inconvenience of farming around field obstacles. Average annual farm cash flow would increase from $16 to $45 per acre. However, drainage of 2.1 million acres in Central and Northern Alberta would require a large public investment. Without some mitigation of habitat losses, drainage would significantly reduce the production of ducks, geese and other wildlife. Techniques such as on and off-farm upstream water retention would significantly reduce costs and minimize environmental impacts as compared to uncontrolled drainage. These types of up-

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stream controls have been used as the basis for calculating the drainage costs. There are an additional 2.7 million acres of potentially drainable organic soils. Costs and benefits from drainage of these additional areas are not included in this study's economic results.

Direct Net Benefits: Full Drainage implementaiton would produce benefits in the agricultural sector of $740 million. Deducting investment costs and lost hunting benefits would reduce the net benefits to close to $23 million.

Growth in the Provincial Economy: The potential growth in the economy would be $1.4 billion.

The remaining development opportunities could be directly undertaken by farmers and would not require major infrastructure development.

4. **Deep Plowing**. Solonetzic soils have a hardpan layer which restricts root and water penetration, water holding capacity, nutrient uptake and crop yields. Deep plowing breaks up this hardpan and produces a chemical balance which prevents the hardpan layer from reforming. Average incremental farm cash flow would range from $15 to $38 per acre per year. Deep Plowing of 2.2 million acres would not impact other resources.

   Direct Net Benefits: Deep plowing would produce agricultural benefits of $570 million. Deducting investment costs would reduce the net benefits to $420 million.

   Growth in the Provincial Economy: Growth in the economy would be $700 million.

5. **Liming**. The range of crops and potential yields are limited on acid soils. Ground limestone or marl can be applied to neutralize the acidity of the soil and improve agricultural productivity. The increase in average annual farm cash flow would be $9 to $10 per acre. Liming of 2.6 million acres would not impact other resources. Economic analysis of 90 thousand acres in the Brown Soil Zone was not conducted because of a lack of information.

   Direct Net Benefits: Liming would produce increased benefits for the agricultural sector of $220 million, and net benefits of $120 million when investment costs are subtracted.

   Growth in the Provincial Economy: Growth in the economy would be over $290 million.

6. **Summerfallow Reduction**. The increased use of fertilizers, herbicides and moisture conservation tillage techniques have reduced the yield advantages of summerfallow, making possible an increase in the cropping of cultivated acreage and in total production. The reduction of a total of 1.4 million acres of summerfallow would result in significant soil conservation benefits. Of this total, approximately 0.5 million acres in the Brown Soil Zone was not given full economic analysis because it was found to be uneconomical at the farm level. Summerfallow reduction would not involve any significant public or private investment nor would it create negative impacts on other resources. The increase in average annual farm cash flows would be $-1 to $10 per acre.

   Direct Net Benefits: Reducing Alberta's summerfallow acreage would increase benefits in the agricultural sector by $50 million. Since there are no investment costs, direct net benefits would be the same $50 million amount.

   Growth in the Provincial Economy: Growth in the economy would be over $60 million.

7. **Range Improvement**. The breaking and seeding of prairie rangeland, and the clearing, breaking and seeding of woodland range to more productive grass species can increase the grazing capacity of these lands. A total of 1.4 million acres were found to be physically suitable for range improvement. However, the improvement of 0.4 million acres of woodland range was excluded from the full economic analysis because it was found to be economically unattractive to the farmer. Range improvement would create moderate economic benefits, but would reduce wildlife habitat. Average incremental farm cash flow increases would range from $1 to $17 per acre per year for prairie range improvement.

   Direct Net Benefits: Prairie Range Improvement would increase direct agricultural benefits by $80 million. Investment costs of $40 million and lost wildlife values of $42 million would produce a loss of $2 million.

   Growth in the Provincial Economy: Growth in the economy would be $40 million.

8. **Prairie Range Conversion**. The productivity of arable land currently used for pasture can be intensified by growing cultivated crops. Conversion of 3.5 million acres would not require public investment. Average annual farm cash flows would increase by $25 to $36 per acre. However, conversion would reduce the amount of range available for beef producers and would require careful management to control potential soil erosion and salinization. Development of this option would reduce wildlife habitat.

   Direct Net Benefits: Conversion would result in $390 million in benefits for the agricultural sector. Subtraction of investment costs and lost wildlife values would reduce the net benefits to $270 million.

   Growth in the Provincial Economy: Growth in the economy would be $520 million.

9. **Woodland Conversion**. Woodland cover on arable lands in the settled portion of the province can be cleared for cultivated crops. Conversion of 7.1 million acres would require no public investment. Average annual farm cash flow would increase by $22 to $46 per acre. Careful management would be required to prevent soil erosion and reduced water quality, particularly in areas where clearing could have a large impact on surface runoff. Full implementation of this option would decrease both wildlife habitat and the harvesting of a significant volume of timber from community farm woodlots. No dollar values were calculated for the lost timber production.

    Direct Net Benefits: Conversion would result in a $2.4 billion increase in direct agricultural benefits. Deducting investment costs and lost wildlife values would produce net benefits of $1.8 billion. No dollar values were calculated for the lost timber production.

    Growth in the Provincial Economy: Total growth in the economy would be $3.4 billion.

10. **Saline Soil Reclamation**. Saline seepage in both irrigated and dryland areas limits crop production. Drainage and vegetative controls can be used to create significant soil conservation benefits. Average incremental farm cash flow would be $33 and $17 per acre per year for irrigated and dryland saline reclamation, respectively. Full reclamation of irrigated saline soils could reduce water quality during periods of low river flows.

    Direct Net Benefits: Reclamation of 250 thousand acres of irrigated saline soil would produce $150 million in direct agricultural benefits and $100 million in net benefits with investment costs subtracted. Reclamation of 1.3 million acres of dryland saline soil in the Brown and Dark Brown Soil Zones would produce $70 million in agricultural benefits and $40 million in net benefits with investment costs subtracted. Information was not available for the economic analysis of 900 thousand acres of dryland saline soils in the Black and Gray Soil Zones.

    Growth in the Provincial Economy: Growth in the economy would be $230 million and $120 million for irrigated and dryland saline soil reclamation, respectively.

D. Interpretation of Findings

Several criteria were used to evaluate the resource management options. These criteria include the magnitude of production potential, financial returns to farmers, the economic benefits and costs within the provincial economy, and various non-economic impacts on other resource users. The economic benefits include direct benefits to the agricultural sector and the secondary benefits resulting from agricultural development. Economic costs include public and private investment requirements, direct benefits lost in other resource sectors and secondary benefits lost as a result of reduced activity in other sectors.

1. Magnitude of the Options

Table 1 compares the acreage available for development and the annual production potential for each of the options. Production potential is shown on a per acre and total area basis. Irrigation Expansion and Reclamation of Irrigated Saline Soils have the highest production potential from a per acre perspective, while Green Area Conversion and Woodland Conversion could produce the largest total increase in annual agricultural output because of the large potential acreages involved.

2. Attractiveness to the Farmer

Farm cash flow is another important measure for evaluating development options. Table 2 shows the relative attractiveness of development options to the farmer with 1982 levels of support, and without direct development assistance. Only those forms of assistance related to on-farm resource development were taken into account in this analysis. These results indicate the degree to which direct public support contributes to farmer profitability. The range of values shown reflects the variation in agricultural productivity within the province.

Average farm cash flow, with 1982 support levels, ranges from a low of -$18 per acre per year for Green Area Conversion to a high of between $26 to $129 per acre per year for Irrigation Expansion. The negative result shown for the Green Area Conversion would change to a break-even outcome over a 30 year period if the farmer had a minimum of 30 per cent equity in the on-farm investment (rather than the assumed zero equity). Fringe development where farms are expanding and investment in equipment already exists, would make this option more attractive. Average annual farm cash flow would then closely approximate the minimum $22 per acre per year return for the Woodland Conversion option.

3. Investment Requirements

Table 3 shows the public and private investment requirements associated with each development opportunity. The Total Public and Private Investment indicates the costs, in present value terms, if all acreages were developed. Public and private investment requirements are also shown on a per acre basis and are indicative of the cost for partial development. The farmer's share of these costs is shown in the final column. These are based on the assumption that the farmer would pay all on-farm costs and no infrastructure costs. Green Area Conversion, Irrigation

TABLE 1 PROVINCIAL SUMMARY: POTENTIAL SCALE

Option	Potential Area (million acres)	Per Acre Additional Annual Agricultural Production ($/acre/year)	Additional Annual Agricultural Production With Full Implementation ($ million/year)
1. Green Area Conversion	9.2	83	762
2. Irrigation Expansion	1.1	268	306
3. Drainage	2.1	114	241
4. Deep Plowing	2.2	37	83
5. Liming	2.6	19	50
6. Summerfallow Reduction	1.4	100	137
7. Range Improvement			
— Woodland	0.4	84	31
— Prairie	1.0	17	18
8. Prairie Range Conversion	3.5	54	191
9. Woodland Conversion	7.1	80	568
10. Saline Soil Reclamation			
— Dryland	2.2	27	59
— Irrigated	0.3	212	53

TABLE 2 PROVINCIAL SUMMARY: ON-FARM FINANCIAL ANALYSIS

	Average Annual Farm Cash Flow With Existing Direct Development Assistance ($/acre/year)	Average Annual Farm Cash Flow Without Direct Development Assistance ($/acre/year)
1. Green Area Conversion	-18	-26
2. Irrigation Expansion	26 to 129	21 to 126
3. Drainage	16 to 45	7 to 40
4. Deep Plowing	15 to 38	12 to 35
5. Liming	9 to 10	1 to 3
6. Summerfallow Reduction	-1 to 10	-4 to 9
7. Range Improvement		
— Woodland	-7 to -8	-10 to -12
— Prairie	1 to 17	0 to 16
8. Prairie Range Conversion	25 to 36	21 to 32
9. Woodland Conversion	22 to 46	16 to 39
10. Saline Soil Reclamation		
— Dryland	17	9
— Irrigated	33	23

Expansion and Drainage have high infrastructure costs and are the only options requiring public investment. Irrigation Expansion has the highest total and per acre investment requirements.

4. **Attractiveness to the Province**

The provincial benefit cost analysis produced the Direct Net Benefits shown in Table 4. These results show the benefits to the agricultural sector minus investment the benefits to the agricultural sector minus investment costs and lost benefits in other resource sectors. The direct net benefits are negative for both Green Area Conversion and Irrigation Expansion, but range as high as $400 per acre for Irrigated Saline Soil Reclamation.

TABLE 3 PROVINCIAL SUMMARY: INVESTMENT REQUIREMENTS

Option	Total Public And Private Investment ($ million, present value)	Per Acre Public And Private Investment ($/acre, present value)	Per Acre Private (Farmer's) Investment ($/acre, present value)
1. Green Area Conversion	1 520	165	107
2. Irrigation Expansion	1 783	1 565	119
3. Drainage	702	331	155
4. Deep Plowing	146	66	66
5. Liming	95	38	38
6. Summerfallow Reduction	0	0	0
7. Range Improvement			
— Woodland	N/C	N/C	N/C
— Prairie	40	38	38
8. Prairie Range Conversion	85	24	24
9. Woodland Conversion	553	78	78
10. Saline Soil Reclamation			
— Dryland	27	21	21
— Irrigated	47	188	188

N/C: Not Calculated

TABLE 4 PROVINCIAL SUMMARY: ECONOMIC ANALYSIS

Option	Direct Net Benefits With Full Implementation ($ million)	Direct Net Benefits ($/acre)	Growth In The Provincial Economy With Full Implementation ($ million)	Growth In Provincial Economy ($/acre)
1. Green Area Conversion	-816	-89	-1 941	-211
2. Irrigation Expansion	-1 150	-1 009	1 934	1 698
3. Drainage	23	11	1 366	644
4. Deep Plowing	422	190	695	313
5. Liming	124	48	294	117
6. Summerfallow Reduction	48	51	64	69
7. Range Improvement				
— Woodland	N/C	N/C	N/C	N/C
— Prairie	-2	-1	42	45
8. Prairie Range Conversion	268	76	515	146
9. Woodland Conversion	1 788	253	3 417	483
10. Saline Soil Reclamation				
— Dryland	44	34	118	91
— Irrigated	100	400	225	900

N/C: Not Calculated

Table 4 also shows the Growth in the Provincial Economy or additional value added which would result from each of the development opportunities. These figures show the value added from increased agricultural output and investment, minus the reduced value added from lower timber production, hunting and trapping activity. They include both direct and secondary benefits as well as those lost, assuming unemployed resources would be available. Growth in the Alberta economy is negative for Green Area Conversion, primarily due to forestry losses, but ranges as high as $1 698 per acre for Irrigation Expansion because of the large investment in infrastructure.

5. **Impacts on Other Resources**

Several options could significantly impact other resource uses. Green Area Conversion would affect some of Alberta's most productive forest lands. Impacts would include the loss of 3.9 million acres (18 per cent) and 1.8 million acres (seven per cent) of the province's currently productive deciduous and coniferous forests, respectively. These impacts would result in the loss of 24 per cent of the deciduous and 10 per cent of the coniferous annual allowable cut for Alberta's forest industry.

Green Area Conversion, Woodland and Prairie Range Conversion would negatively affect of 45 per cent of the moose population, 14 per cent of the elk population, 47 per cent of the mule and white-tailed deer, and 55 per cent of the antelope population. Drainage of non-permanent wetlands in Northern and Central Alberta would reduce migratory bird habitat and 54 and 33 per cent of Alberta's duck and Canada goose production, respectively. From a North American perspective, this loss would be approximately equivalent to a three per cent decline in both duck and Canada goose production. The improvement or enhancement of existing habitat to compensate for habitat losses would require significant new funding and the provision of a secure land base.

Degradation of soil and water resources may occur unless proper management is exercised for the Green Area Conversion, Irrigation Expansion, Drainage, Prairie Range Improvement, Prairie Range Conversion and Woodland Conversion opportunities. Four of the development options, Deep Plowing, Liming, Summerfallow Reduction and Dryland Saline Soil Reclamation, have no identified negative impacts. These would, instead, have a positive impact through soil improvement.

Other significant positive impacts could be created by two of the development opportunities. Green Area Conversion would result in the development of a transportation and utility infrastructure in Northern Alberta which would benefit non-agricultural sectors. Irrigation Expansion would create a water supply for municipal and industrial users in Southern Alberta. It would lead to a stabilization of agricultural production and an increase in water based recreation opportunities. It could also improve soil quality in some salinized areas.

6. **Regional Perspective**

Another important perspective on agricultural resource development opportunities in Alberta is their regional impact. Three broad regions, based on soil zones, were defined for this purpose (Figure 1).

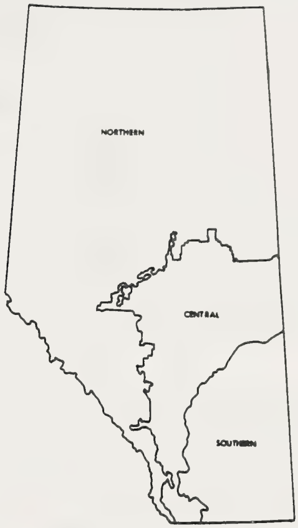


Figure 1: Generalized Study Regions

From the perspective of farm profitability, those options which are most attractive in each region are:

1) Southern Region:
    Irrigation Expansion, Irrigated Saline Soil Reclamation

2) Central Region:
    Woodland Conversion, Deep Plowing, Drainage, Prairie Range Conversion
3) Northern Region:
    Drainage, Woodland Conversion

These results illustrate the regional analysis which will be required to more fully evaluate each of the development opportunities.

In addition to the analysis of economic and physical impacts, the Agricultural Land Base Study identified government programs which promote the expansion and intensification of agricultural production in Alberta. Fifty-five government programs, primarily administered by the provincial government, were identified as directly promoting or supporting resource development for agricultural production.

E. Resource Development Policy Issues

A number of important policy issues are raised by this study. These must be carefully considered in formulating action plans.

1. Green Area Conversion significantly reduces timber production and wildlife habitat. Expansion of agricultural

production onto Green Area lands should only be considered after careful identification of those locations where agricultural productivity is high and impacts on the forest industry are low. Conversion would also result in the large scale displacement of trapping and the loss of prime habitat essential to subsistence hunting. The equity requirements for new farm development in the Green Area are high. Farm expansion and other means of promoting adequate farmer equity should be considered. Full development of the potential acreage under this option would require large-scale investment in community and regional infrastructure.

2. Irrigation Expansion would create significant benefits through regional economic spinoffs, stabilization of the effects of drought, water supply and recreational benefits. It would produce attractive financial returns to the farmer. The very high infrastructure and public investment requirements must, however, be recognized. Limited irrigation expansion may be more advisable than maximum expansion. Those projects which require less infrastructure and are less costly, should be identified.

3. Drainage can produce significant benefits through increased agricultural production and reduced farming costs. This could seriously reduce wildlife habitat and increase downstream flooding and soil erosion. Protection or enhancement of key wildlife habitat and adequate planning and design of drainage works would be required to offset these impacts. Many potential impacts could be eliminated by on-farm water consolidation and management.

4. Deep Plowing, Liming and Irrigated Saline Soil Reclamation show financial and economic benefits which are high relative to the current rates of adoption by farmers. These options also have little or no negative impacts on other resource users. Improved extension or assistance programs may be warranted to increase the rate of adoption.

5. Prairie Range Conversion shows good financial and economic results, though full development of this option would impact cow-calf production and ranching lifestyles.

6. Prairie Range Conversion and Woodland Conversion would reduce wildlife habitat significantly in the settled area of the province if these options were undertaken to their full potential. The regional distribution of wildlife populations must be considered.

7. Summerfallow Reduction is an important objective with respect to soil conservation in Alberta. Canada Wheat Board quota policy and farmer awareness of the benefits of reduced summerfallow needs to be addressed.

8. Green Area Conversion, Irrigation Expansion, Drainage, Range Improvement, Prairie Range Conversion and Woodland Conversion require careful conservation management in order to control soil erosion and reduced water quality. Options such as Deep Plowing, Liming, Summerfallow Reduction and Saline Soil Reclamation would benefit soil conservation.

F. Conclusions

Compared to Alberta's 1982 improved farmland base of 30 million acres generating $3.8 billion in farm cash receipts, this study has shown that an expansion of the agricultural land base by over 22 million acres (Green Area Conversion, Drainage, Prairie Range and Woodland Conversion) and an intensification of production on close to 11 million acres could increase agricultural production by $2.5 billion annually.

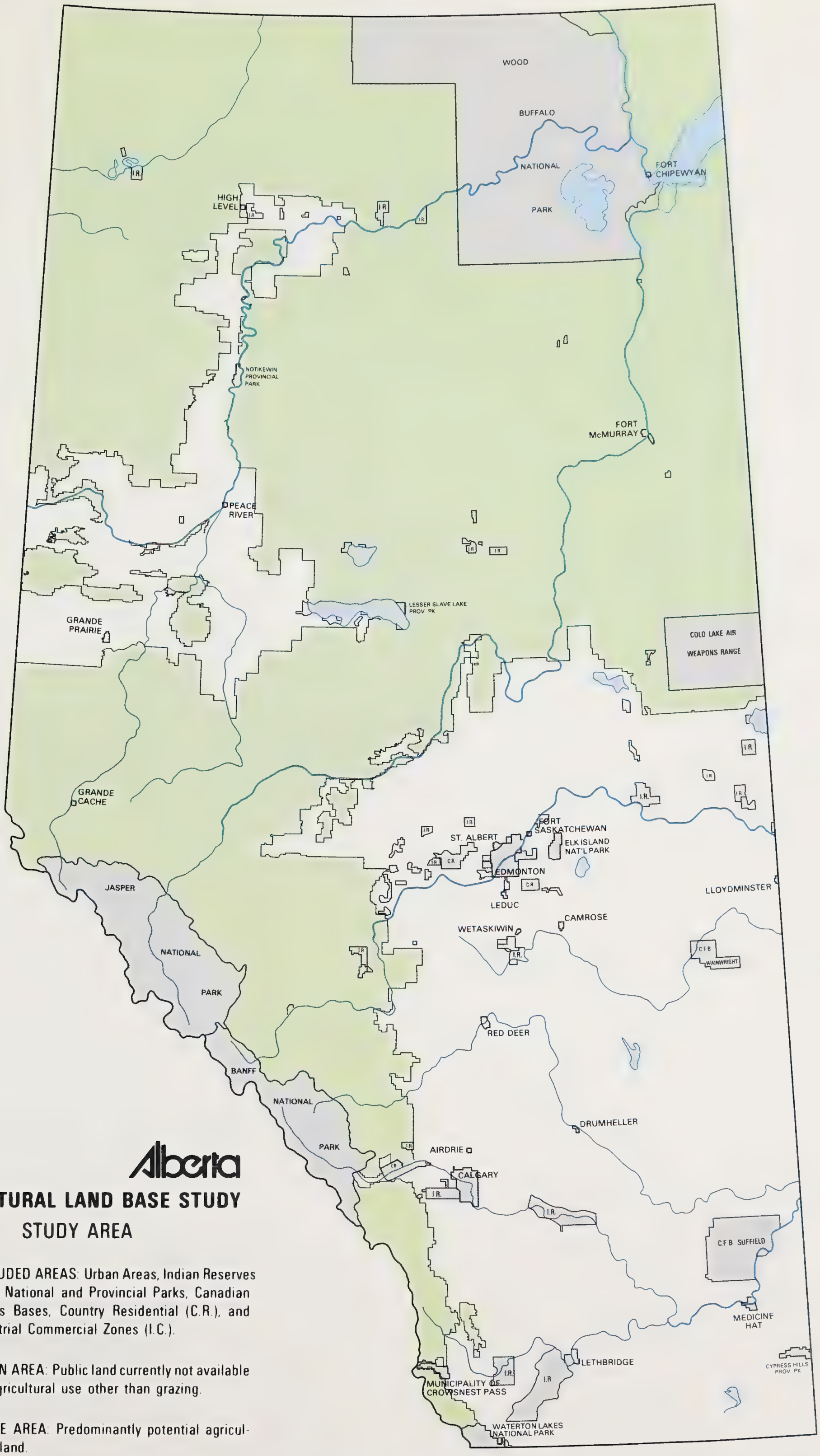
Several of the development opportunities require considerable public and private investment and would negatively impact other resource sectors. While the size of the benefits and costs may change over time, as commodity prices and input costs vary, it is expected that their ranking under the various criteria used in this study will remain constant.

This study has produced a large amount of data on the potential for agricultural development. The maps contribute to our understanding of the extent and location of each development opportunity. The study's most valuable contribution is the development of a broad perspective from which to evaluate and compare the major agricultural development opportunities.

A number of steps would be required before the development options described in this study could be implemented. Further work would be required to identify the prime locations for each option and to update and refine the financial and economic results from a regional perspective. An important part of this investigation would be be to examine the feasibility of partial development. The results presented are averages and individual projects may be more or less attractive than these results suggest.

Resource conservation opportunities would also need to be investigated in seeking to maximize benefits from our land and water resources. Programs which affect development of the land base might need to be supplemented, strengthened or otherwise adjusted to achieve a desired rate and pattern of development. Funding might also be required to stimulate the adoption of these development opportunities.

While improvements in market availability and farm profitability will be needed to bring about any significant expansion of agricultural production, the Agricultural Land Base Study has shown that the long range capability of our land and water resources should not restrict the future growth of the agricultural industry in Alberta.



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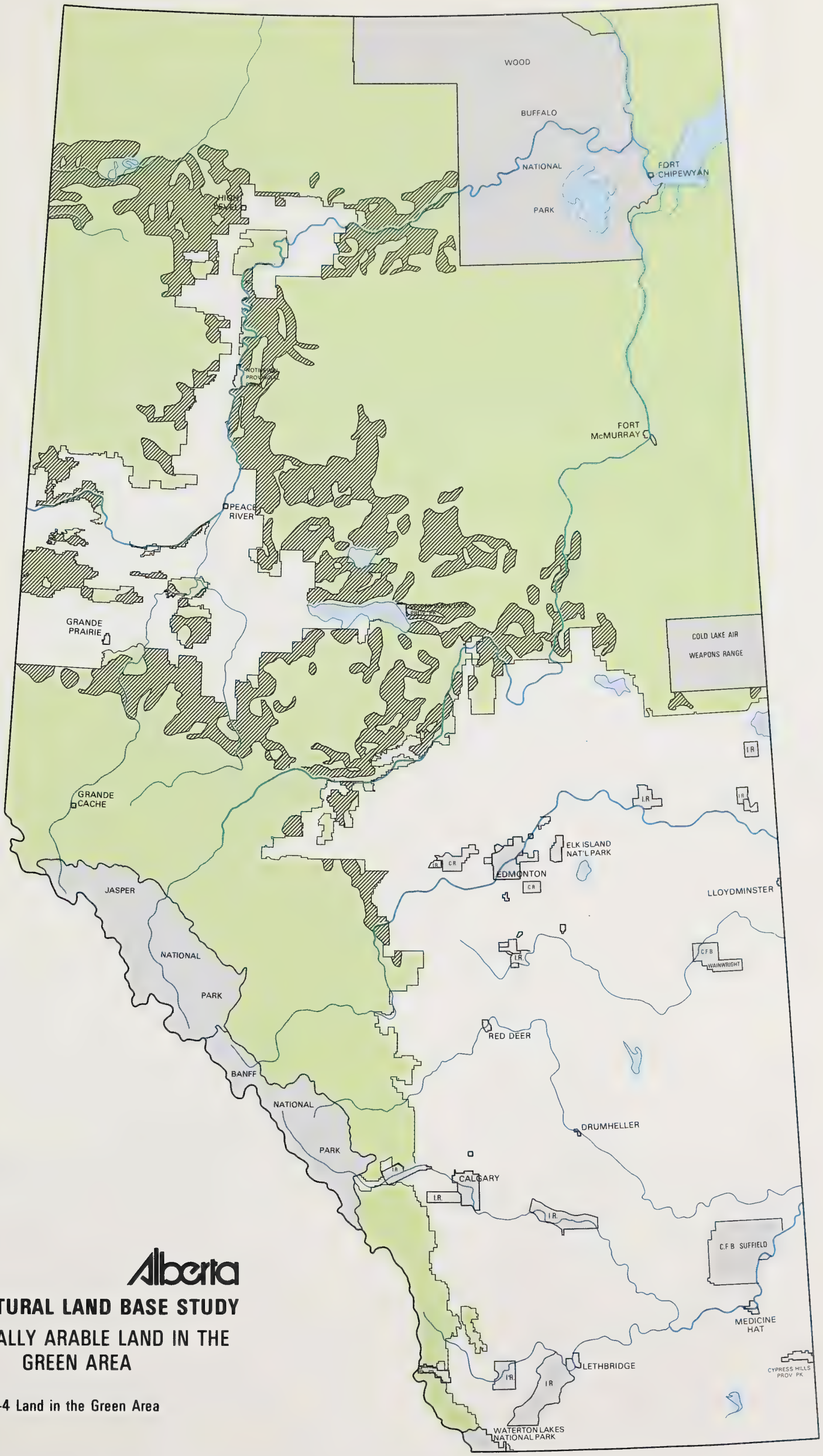
AGRICULTURAL LAND BASE STUDY

STUDY AREA

▨	EXCLUDED AREAS: Urban Areas, Indian Reserves (I.R.), National and Provincial Parks, Canadian Forces Bases, Country Residential (C.R.), and Industrial Commercial Zones (I.C.).
🟩	GREEN AREA: Public land currently not available for agricultural use other than grazing.
⬜	WHITE AREA: Predominantly potential agricultural land.

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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AGRICULTURAL LAND BASE STUDY

POTENTIALLY ARABLE LAND IN THE GREEN AREA

▨ CLI 1-4 Land in the Green Area

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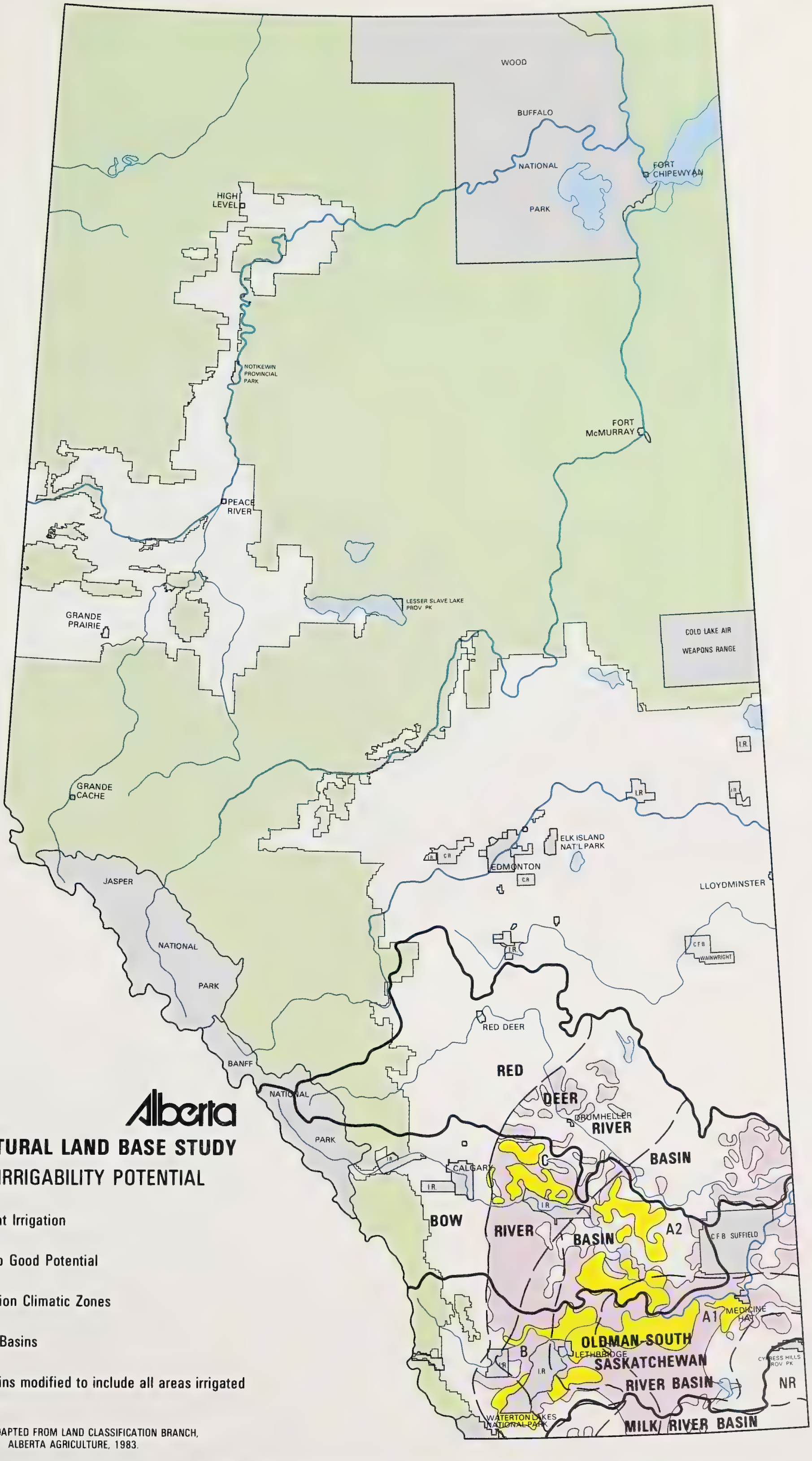

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AGRICULTURAL LAND BASE STUDY

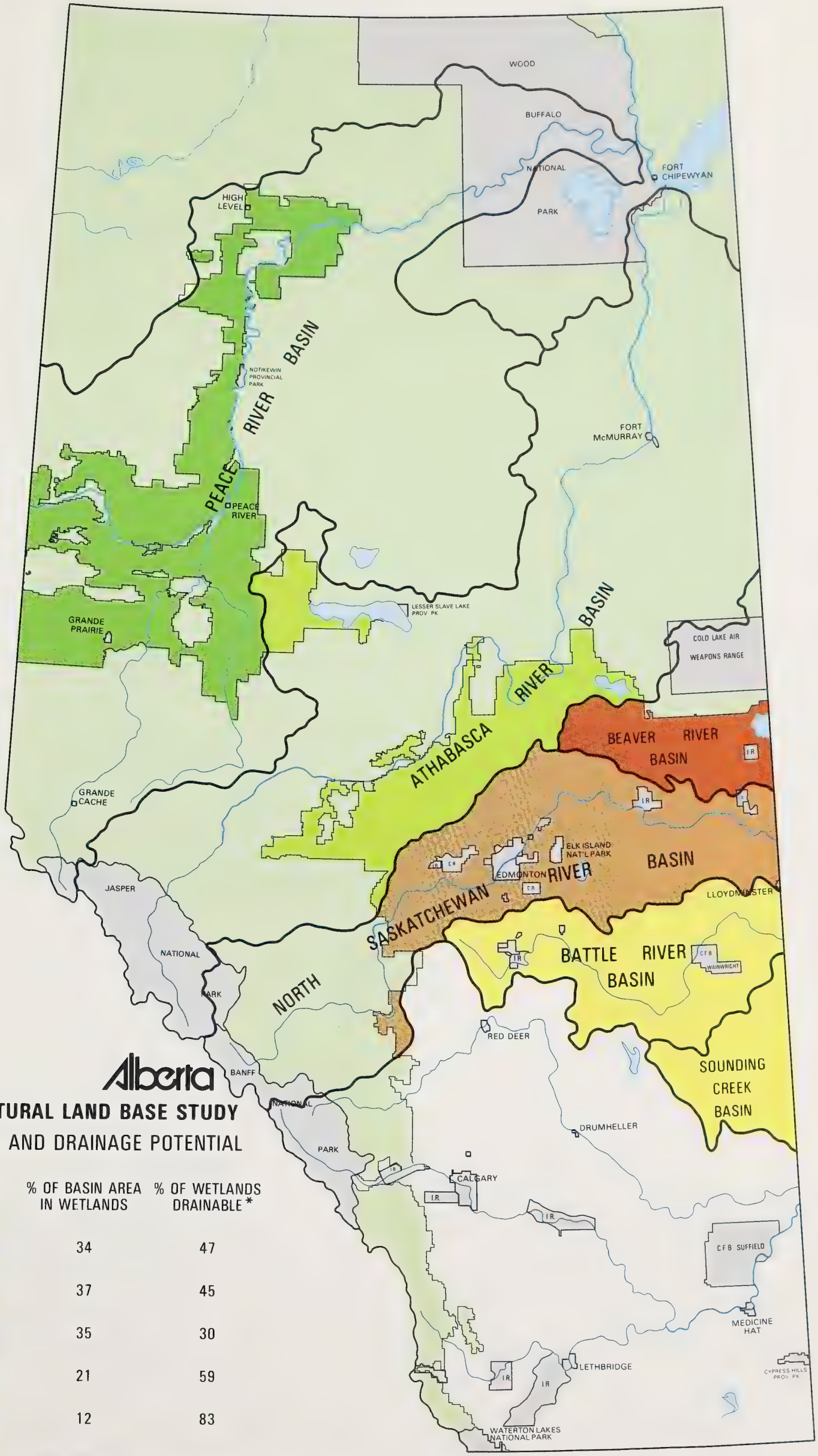
LAND IRRIGABILITY POTENTIAL

🟨	Current Irrigation
▨	Fair to Good Potential
— —	Irrigation Climatic Zones
━━	River Basins

NOTE: River basins modified to include all areas irrigated from that basin.

SOURCE: ADAPTED FROM LAND CLASSIFICATION BRANCH,
ALBERTA AGRICULTURE, 1983.

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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AGRICULTURAL LAND BASE STUDY

WETLANDS AND DRAINAGE POTENTIAL

RIVER BASINS	% OF BASIN AREA IN WETLANDS	% OF WETLANDS DRAINABLE*
🟩	34	47
🟩	37	45
🟥	35	30
🟧	21	59
🟨	12	83

*INCLUDES NON-PERMANENT WETLANDS AND POTENTIALLY DRAINABLE PEATLANDS.

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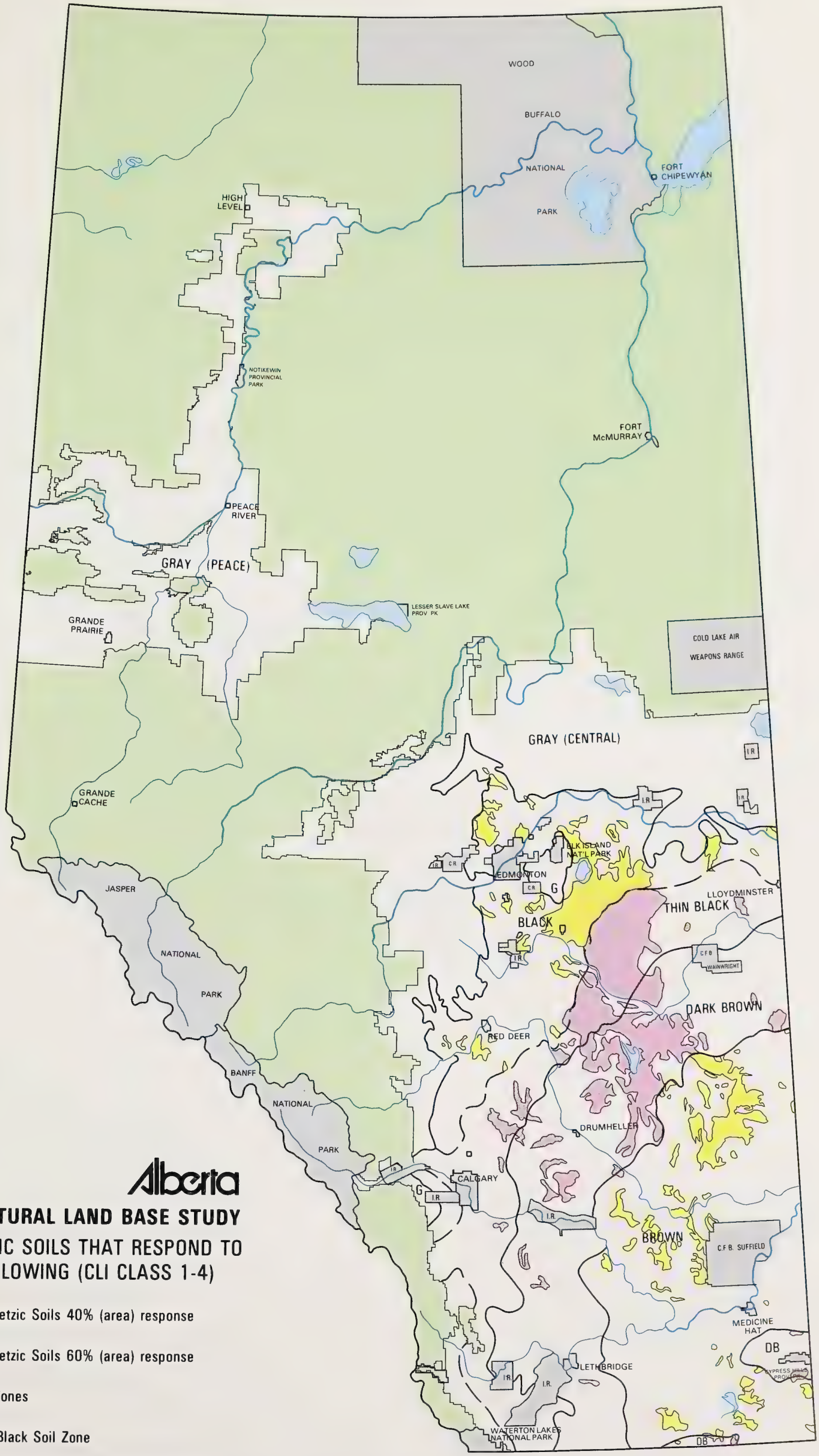


AGRICULTURAL LAND BASE STUDY

SOLONETZIC SOILS THAT RESPOND TO DEEP PLOWING (CLI CLASS 1-4)

🟨 Solonetzic Soils 40% (area) response

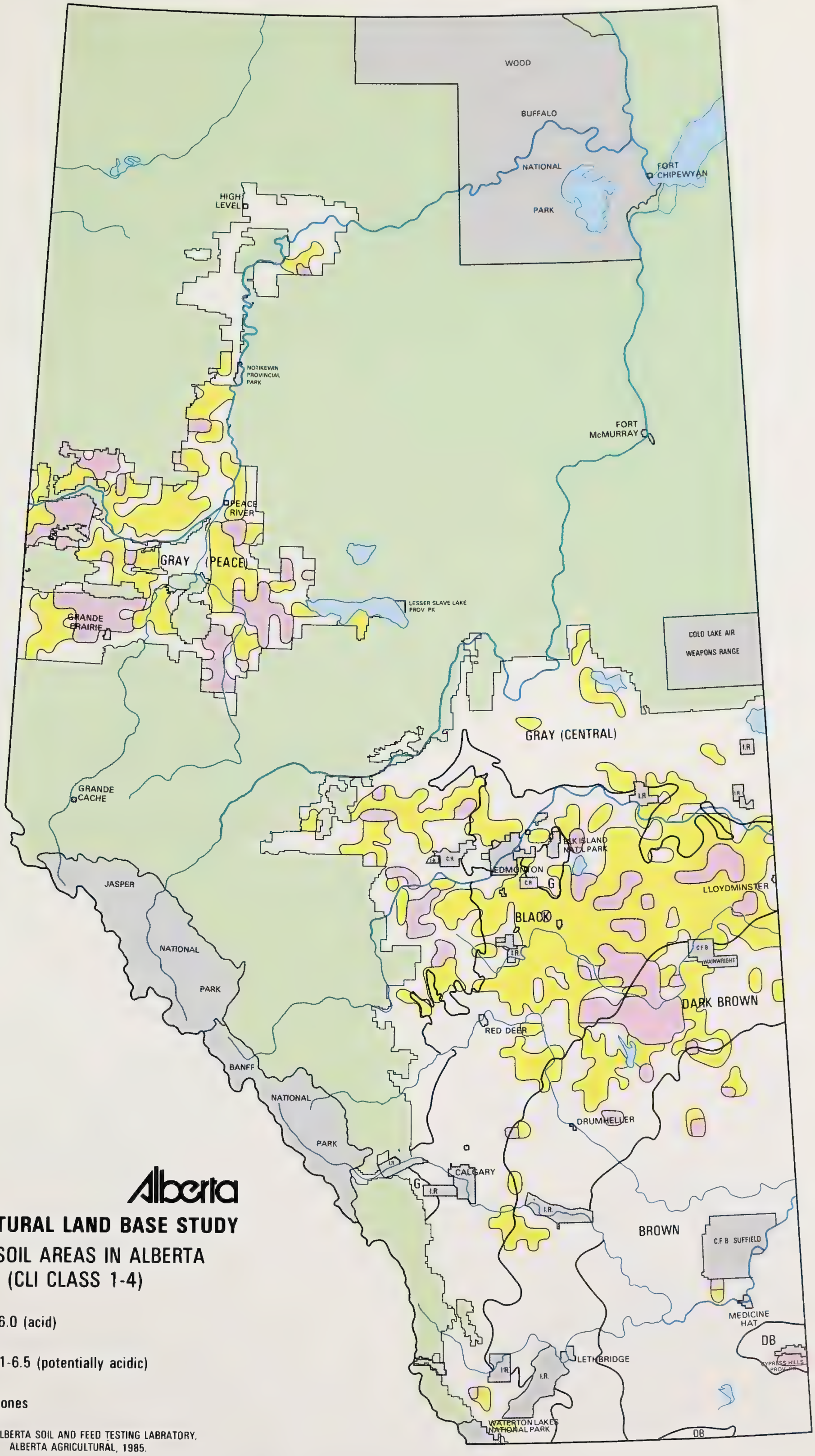
🟪 Solonetzic Soils 60% (area) response

—— Soil Zones

— — Thin Black Soil Zone

SOURCE. LAND USE BRANCH, ALBERTA AGRICULTURE, 1985

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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AGRICULTURAL LAND BASE STUDY

ACID SOIL AREAS IN ALBERTA
(CLI CLASS 1-4)

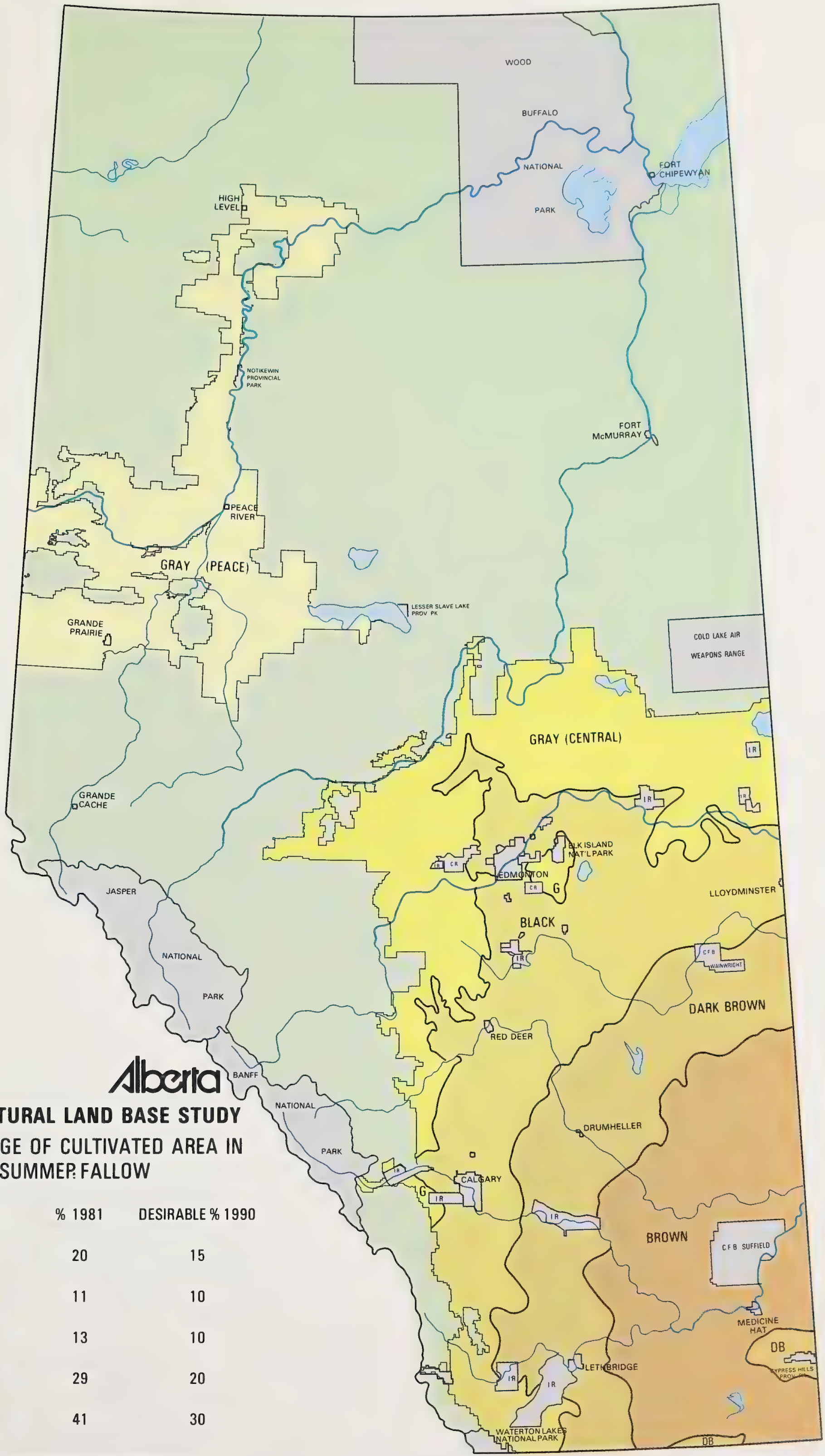
🟪 pH ≤ 6.0 (acid)

🟨 pH 6.1-6.5 (potentially acidic)

— Soil Zones

SOURCE: ALBERTA SOIL AND FEED TESTING LABORATORY,
ALBERTA AGRICULTURAL, 1985.

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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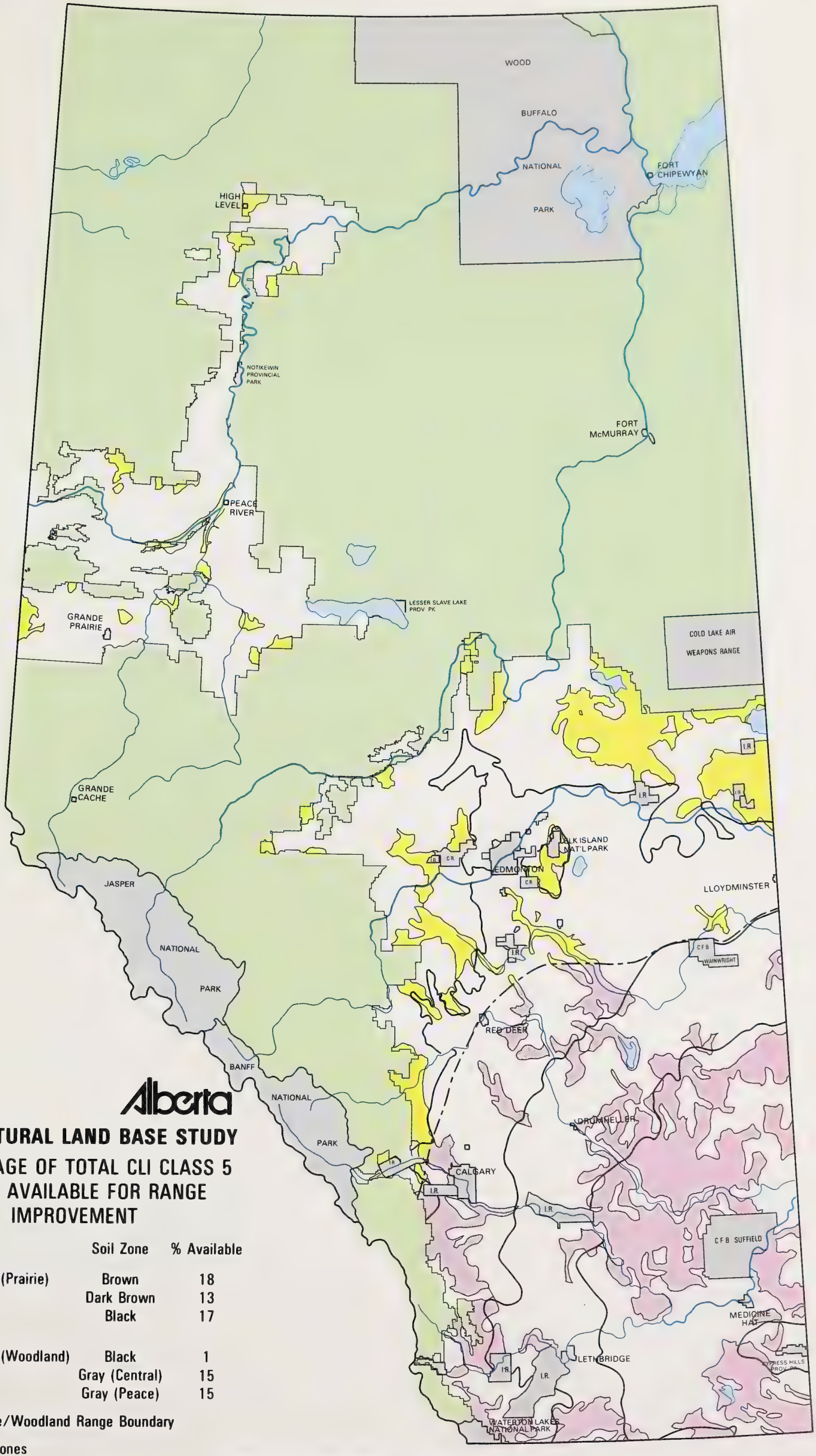
AGRICULTURAL LAND BASE STUDY

PERCENTAGE OF CULTIVATED AREA IN SUMMER FALLOW

SOIL ZONE	% 1981	DESIRABLE % 1990
🟩	20	15
🟨	11	10
🟨	13	10
🟫	29	20
🟧	41	30

ADAPTED FROM CANADA GRAINS COUNCIL, 1983.

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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AGRICULTURAL LAND BASE STUDY

PERCENTAGE OF TOTAL CLI CLASS 5 LANDS AVAILABLE FOR RANGE IMPROVEMENT

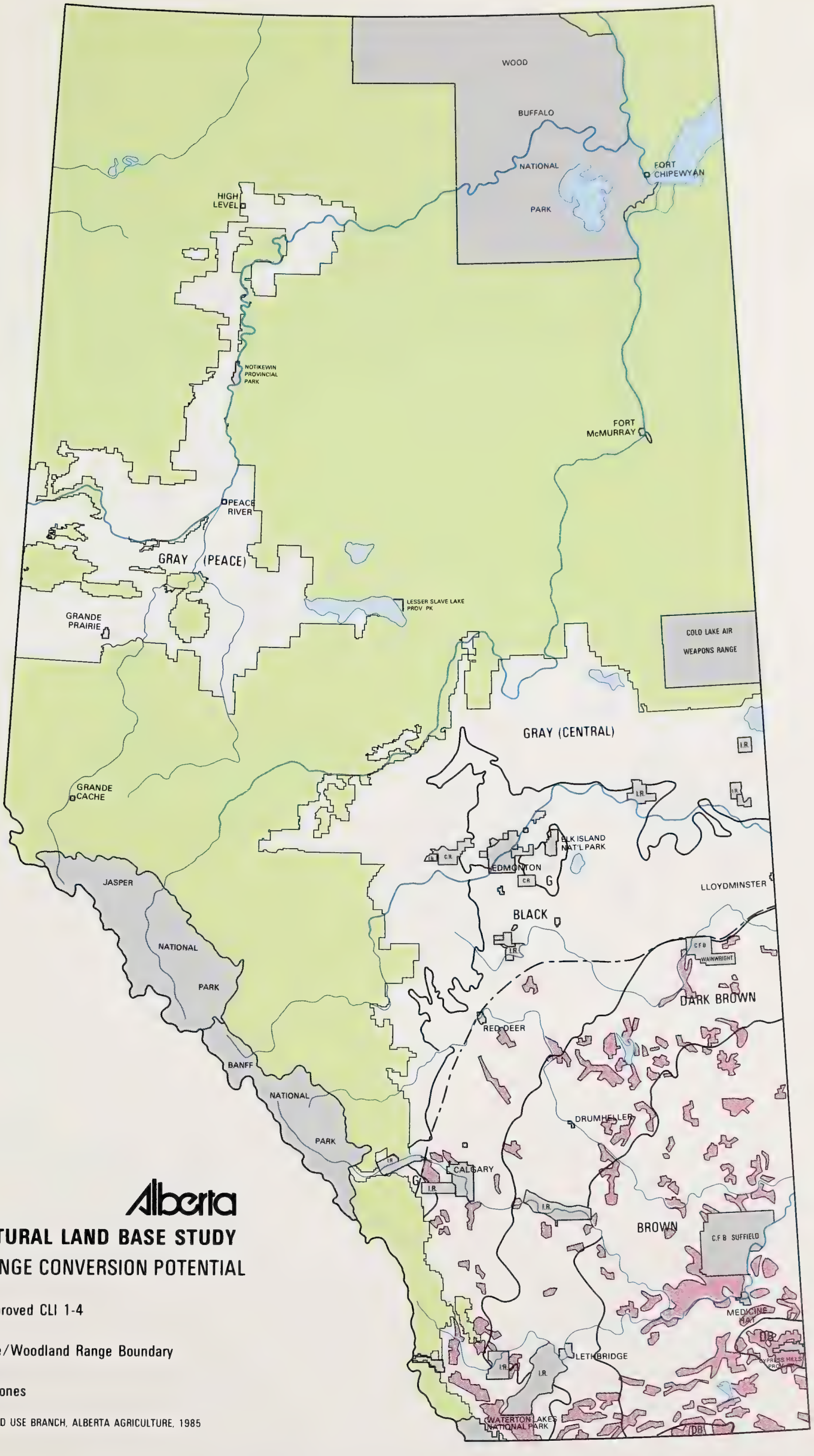
		Soil Zone	% Available
🟪	CLI 5 (Prairie)	Brown	18
		Dark Brown	13
		Black	17
🟨	CLI 5 (Woodland)	Black	1
		Gray (Central)	15
		Gray (Peace)	15

– – – Prairie/Woodland Range Boundary

—— Soil Zones

SOURCE: LAND USE BRANCH, ALBERTA AGRICULTURE, 1985.

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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AGRICULTURAL LAND BASE STUDY

PRAIRIE RANGE CONVERSION POTENTIAL

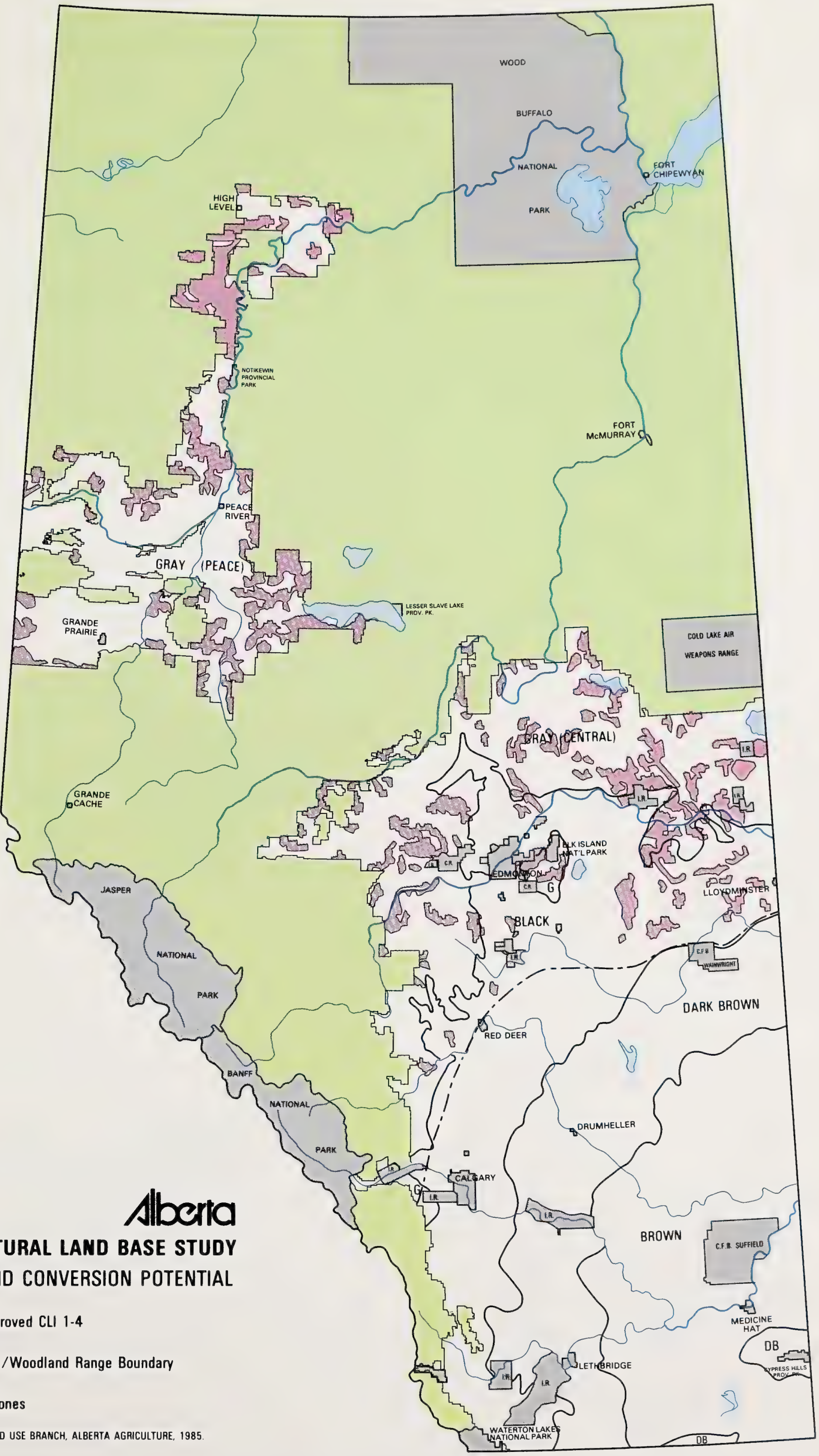
▨ Unimproved CLI 1-4

— · — Prairie/Woodland Range Boundary

—— Soil Zones

SOURCE. LAND USE BRANCH, ALBERTA AGRICULTURE, 1985

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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AGRICULTURAL LAND BASE STUDY
WOODLAND CONVERSION POTENTIAL

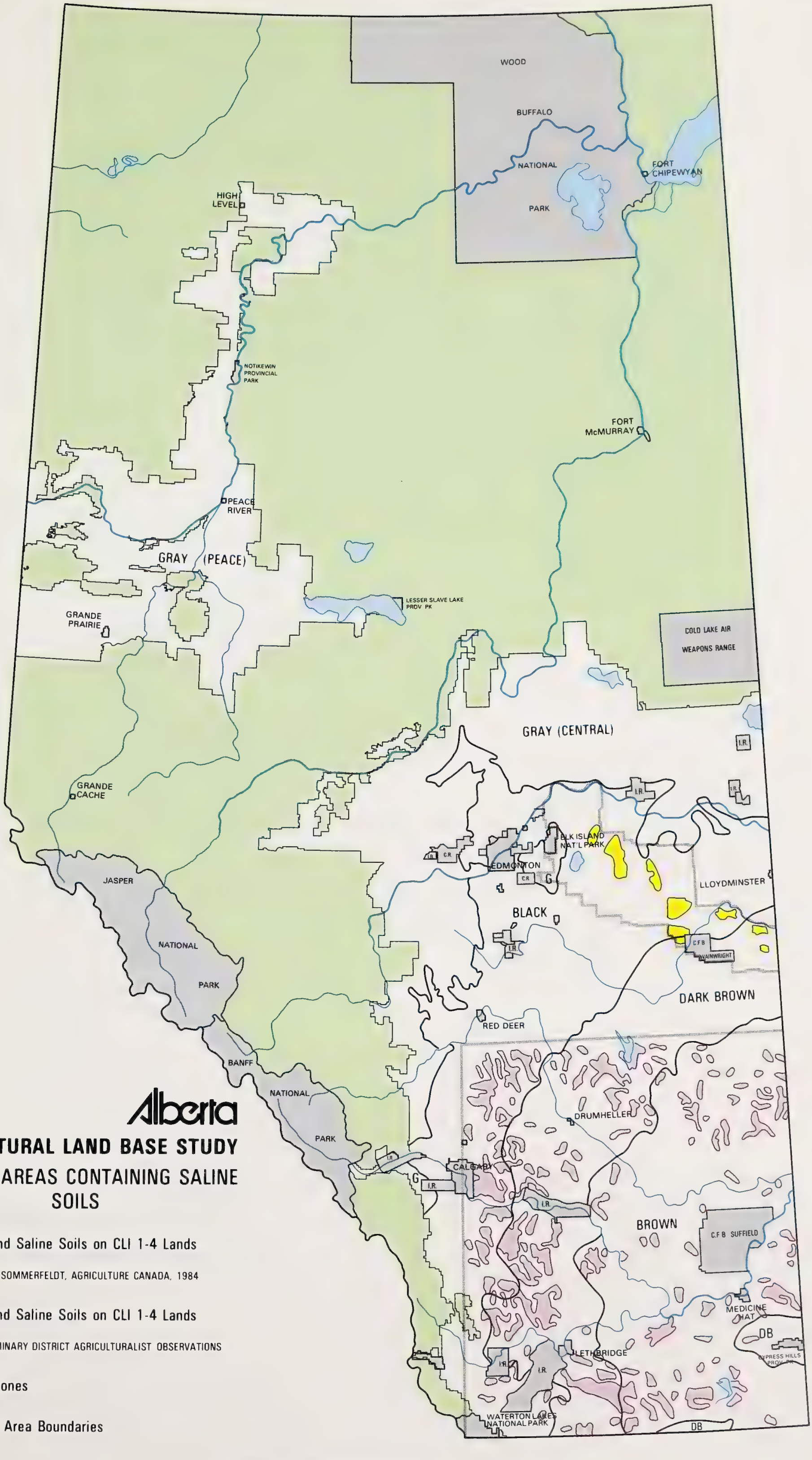
▨ Unimproved CLI 1-4

– – – Prairie/Woodland Range Boundary

—— Soil Zones

SOURCE: LAND USE BRANCH, ALBERTA AGRICULTURE, 1985.

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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AGRICULTURAL LAND BASE STUDY

DRYLAND AREAS CONTAINING SALINE SOILS

🟪 Dryland Saline Soils on CLI 1-4 Lands

SOURCE T SOMMERFELDT, AGRICULTURE CANADA, 1984

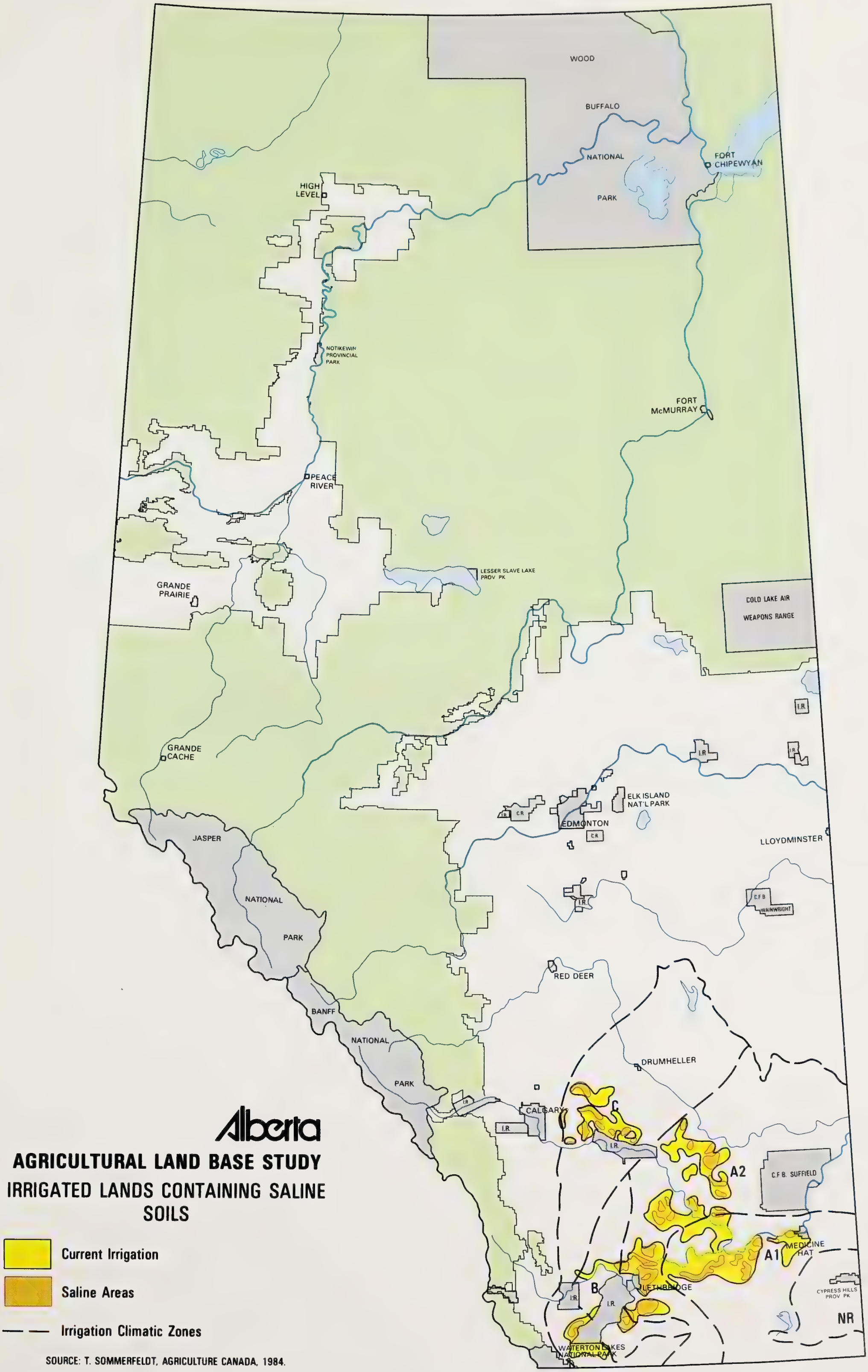
🟨 Dryland Saline Soils on CLI 1-4 Lands

SOURCE PRELIMINARY DISTRICT AGRICULTURALIST OBSERVATIONS

— Soil Zones

— Study Area Boundaries

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.



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AGRICULTURAL LAND BASE STUDY

IRRIGATED LANDS CONTAINING SALINE SOILS

🟨 Current Irrigation

🟧 Saline Areas

— — Irrigation Climatic Zones

SOURCE: T. SOMMERFELDT, AGRICULTURE CANADA, 1984.

PRODUCED BY THE RESOURCE EVALUATION AND PLANNING DIVISION, ALBERTA ENERGY AND NATURAL RESOURCES, 1985.

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